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Title: Trinity Observations

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Intended for: Material to be used as background during the Trinity anniversary.

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## Trinity Observations

Various historical documents which record the observations of various scientists who observed the Trinity Test in southern New Mexico. The documents are contemporaneous with the test.

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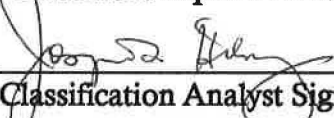
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27 MAY 2020  
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L. M. Redman

27 July 1945.

Lt. Taylor, USA

Captain Larkin, USN

July-17-1979

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Description of Trinity Test, as Observed From Coordinating Council Area

1. The area assigned to the Coordinating Council, from which I observed the Trinity Test Shot, was understood to be approximately 20 miles from point of detonation. The intervening landscape was quite flat, and a clear but distant view of the explosion was possible.

2. At the moment of detonation I was seated on the ground facing in the general direction of the test setup, with my eyes fixed on the ground immediately in front. This I did deliberately, in order to avoid the blinding flash which I expected at the instant of detonation.

3. My first impression was of sudden brilliant lighting of the surrounding landscape, accompanied by a momentary flash of heat. I remember a feeling of surprise as the illumination, initially quite brilliant, continued to increase for a brief interval. After raising the dark filter to protect my eyes, I looked in the direction of the light. Although the filter provided was designed to eliminate over 99% of the light, the intensity of illumination was such that there was a momentary sensation of blinding, similar to that following a close flash of lightning on a dark night.

4. Within perhaps two seconds after the initial flash, it became possible to distinguish details of the explosion without the use of the filter. A ball of light about three or four hundred yards in diameter, was clearly evident about a thousand feet above the ground. Beneath this ball there appeared to be a column of red flame about 150 or 200 yards in diameter. Flickering red reflections were distinctly seen on the clouds above the ball of light.

5. As the intensity of light diminished, a smokey, grayish-brown ball took shape. It was noted that a fringe of violet light surrounded this ball and that the ball was rising rapidly, with some increase in diameter. The column beneath the ball darkened until it appeared to be a dense black pillar under the grayish-brown ball. At about ten seconds after detonation, the top of the ball seemed to flatten, and the ball and column took on the shape of a vast mushroom.

6. Close to the ground and slowly spreading out on all sides from the point of detonation, was a white cloud which looked much like ground fog. This cloud, I assumed, was composed of dust raised by the blast wave. The maximum diameter of this cloud I estimated to be about two miles.

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LMR 7-17-79

JUL 9 1981

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SPECIAL RE-REVIEW  
FINAL DETERMINATION  
UNCLASSIFIED, DATE JUL 9 1981

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Lt. Taylor

- 2 -

27 July 1945.

7. The sound wave when it reached my position, was unexpectedly sharp. I would describe the sound as being similar to the crack of thunder following a near stroke of lightning. It was sharper and lacked the booming sound of a large gun firing. There was no perceptible earth shock felt at any time.

8. Ten minutes after the detonation the mushroom-like cloud was still quite distinct and rising rapidly, with very little tendency towards dissipating horizontally. About fifteen minutes after the explosion, the pillar under the cloud had faded. The cloud, now a light brownish color, began to fade. The cloud faded from view at about thirty minutes after the explosion.

RAL/hg

R. A. Larkin  
Captain, USN

*See U. S. Navy*

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Classification changed to \_\_\_\_\_  
by authority of the U. S. Atomic Energy Commission,

Per R. D. Krohn 1-31-73  
(Person authorizing change in classification) (Date)

By Th. R. Bramlett 4-3-75  
(Signature of person making the change, and date)

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PER DOC REVIEW JAN. 1973

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U. S. ENGINEER OFFICE  
PROJECT "Y"

SPECIAL RE-REVIEW  
FINAL DETERMINATION  
UNCLASSIFIED, DATE: 8/21/80

WASHINGTON LIAISON OFFICE  
WASHINGTON, D. C.

FROM: CLEAR CREEK, N. M.

25 AUGUST 1945

VERIFIED UNCLASSIFIED

gler 8/13/80  
ems 8/21/80

THE RADIOACTIVITY OF THE SOIL AT TRINITY WAS QUITE HIGH BUT WAS  
CONFINED ALMOST ENTIRELY WITHIN A RADIUS OF TWELVE HUNDRED YARDS  
PD PAREN FOR GENERAL L R GROVES FROM DR LOUIS HEMPELMANN PAREN  
AFTER TWENTY FOUR HOURS THE HIGHEST ESTIMATE OF RADIOACTIVITY IN  
THE CRATER BY MEMBERS OF THE TANK CREW WAS SIX FIVE ZERO R PER  
HOUR PD THIS FELL TO TWO R PER HOUR AT EIGHT ZERO ZERO YARDS AND TO  
ONE SLANT TEN R PER HOUR AT ONE TWO ZERO ZERO YARDS PD AFTER ONE  
WEEK THE ABOVE ACTIVITY HAD DECAYED BY A FACTOR OF FIFTEEN PD  
AFTER THIRTY DAYS THE HIGHEST RADIATION INTENSITY WAS FIFTEEN R  
PER HOUR PD THE AREA CONTAINING SIGNIFICANT ACTIVITY PAREN MORE  
THAN ~~XXX~~ ONE SLANT TEN R PER HOUR PAREN HAD SHRUNK TO A RADIUS OF  
FOUR ZERO ZERO YARDS PD THE RADIATION WAS DUE TO BOTH INDUCED  
RADIOACTIVITY OF THE SOIL (RESULTING FROM THE ACTION OF NEUTRONS  
AND TO THE DEPOSITION OF FISSION PRODUCTS ON THE GROUND PD THE  
INDUCED RADIOACTIVITY WHICH CORRESPONDED TO ABOUT ONE SLANT TWO  
OF THE TOTAL AT ONE DAY CMA WAS CHIEFLY RADIOACTIVE SODIUM PD IT  
DECAYED VERY RAPIDLY PAREN HALF DASH LIFE FIFTEEN HOURS PAREN AND  
WAS INSIGNIFICANT AFTER ABOUT ONE WEEK PD THE FISSION PRODUCTS ARE  
DISAPPEARIVE MORE SLOWLY FOLLOWING ONE SLANT T LAW PD RADIOACTIVE  
MATERIALS DID NOT FALL FROM THE CLOUD OUTSIDE THE ABOVE AREA IN  
AMOUNTS WHICH WOULD BE CONSIDERED DANGEROUS PD IN COMBAT USE DUE TO THE

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PER DQC REVIEW JAN. 1973

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FINAL DETERMINATION  
UNCLASSIFIED  
L. M. Redman  
July-17, 1979

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GREAT HEIGHT OF DETONATION THE NEUTRON INDUCED ACTIVITY OF THE SOIL  
PD  
SHOULD BE INSIGNIFICANT DEPENDING UPON METEOROLOGIC CONDITIONS CMA THE  
ACTIVITY DUE TO FISSION PRODUCTS MAY BE MUCH LESS OR MUCH GREATER THAN  
AT THE TRINITY TEST

Approval for  
Transmission:

Ra Taylor

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PER DOC REVIEW JAN. 1973



SPECIAL RE-REVIEW  
FINAL DETERMINATION  
UNCLASSIFIED, DATE: 8/21/80

U. S. ENGINEER OFFICE  
PROJECT 10-2-15-AM

UNCLASSIFIED

25 AUGUST 1945

WASHINGTON LIAISON OFFICE  
WASHINGTON, D. C.

FROM: CLEAR CREEK, N. M.

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8/13/80  
8/21/80

THE RADIOACTIVITY OF THE CRATER REGION AT TRINITY WAS CONFINED TO A  
ROUGHLY CIRCULAR AREA OF ONE TWO ZERO ZERO YARDS RADIUS PD PAREN FOR  
GENERAL L R GROVES FROM LOUIS HEMPELMANN INFORMATION FOR COL WARREN  
PAREN THE HIGHEST RADIATION INTENSITY WAS ESTIMATED TO BE SIX FIVE  
ZERO R PER HOUR IN THE CRATER AND WAS MEASURED TO BE TWO R PER HOUR  
AT EIGHT HUNDRED YARDS AND ONE SLANT TEN R PER HOUR AT TWELVE HUNDRED  
YARDS PD THE ACTIVITY WAS SPOTTY BEING HIGHEST OVER THE GREEN GLAZED  
MATERIAL PD THE RADIATION FROM THE GROUND WAS DUE TO RADIOACTIVE  
SODIUM AND TO FISSION PRODUCTS IN ABOUT EQUAL AMOUNTS AT TWENTY FOUR  
HOURS CMA THE SODIUM HAD DISAPPEARED AND THE RADIOACTIVE DECAY FOLLOWED  
THE ONE SLANT T LAW PD AT THIRTY DAYS CMA THE HIGHEST RADIATION INTENSITY  
WAS FIFTEEN R PER HOUR AT THE PERIPHERY OF THE CRATER PD THE RADIUS OF  
THE AREA OF SIGNIFICANT RADIATION PAREN MORE THAN ONE SLANT TEN R PER  
HOUR PAREN HAD SHRUNK TO FOUR ZERO ZERO YARDS PD IN COMBAT USE CMA DUE  
TO THE HEIGHT OF DETONATION CMA THERE SHOULD BE LITTLE IF ANY NEUTRON  
INDUCED ACTIVITY OF THE SOIL PD THE ACTIVITY DUE TO FISSION PRODUCTS  
SHOULD BE GREATER OR LESS THAN THAT AT TRINITY DEPENDING UPON METEOROLOGIC  
CONDITIONS CMA ESPECIALLY HUMIDITY

FINAL DETERMINATION  
UNCLASSIFIED  
L. M. Redman

AUG 21, 1980

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PER DOC REVIEW JAN. 1973

Approval for Transmission:

La J. J. J.

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This document consists of \_\_\_\_\_ page(s)  
No. 3 of 4 Copies, Series a

My Observations During the Explosion at Trinity on July 16, 1945 -- E. Fermi

5/15/84  
[Green circular stamp]

On the morning of the 16th of July, I was stationed at the Base Camp at Trinity in a position about ten miles from the site of the explosion.

The explosion took place at about 5:30 A.M. I had my face protected by a large board in which a piece of dark welding glass had been inserted. My first impression of the explosion was the very intense flash of light, and a sensation of heat on the parts of my body that were exposed. Although I did not look directly towards the object, I had the impression that suddenly the countryside became brighter than in full daylight. I subsequently looked in the direction of the explosion through the dark glass and could see something that looked like a conglomeration of flames that promptly started rising. After a few seconds the rising flames lost their brightness and appeared as a huge pillar of smoke with an expanded head like a gigantic mushroom that rose rapidly beyond the clouds probably to a height of the order of 30,000 feet. After reaching its full height, the smoke stayed stationary for a while before the wind started dispersing it.

About 40 seconds after the explosion the air blast reached me. I tried to estimate its strength by dropping from about six feet small pieces of paper before, during and after the passage of the blast wave. Since, at the time, there was no wind I could observe very distinctly and actually measure the displacement of the pieces of paper that were in the process of falling while the blast was passing. The shift was about  $2\frac{1}{2}$  meters, which, at the time, I estimated to correspond to the blast that would be produced by ten thousand tons of T.N.T.

14 JUL 1951  
7-17-79  
M. Redman  
ED TION

JUL 17, 1979

Classification changed to UNCLASSIFIED  
by authority of the U. S. Atomic Energy Commission,  
Per R. D. Krohn 1-31-73  
(Person authorizing change in classification) (Date)

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LANL Classification Group  
JA Brown 4/25/01

SPECIAL RE-REVIEW  
FINAL DETERMINATION  
UNCLASSIFIED, DATE: 1981  
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SPECIAL RE-REVIEW  
FINAL DETERMINATION  
UNCLASSIFIED, DATE: 8/24/80

This Document Contains  
UNCLASSIFIED No. of Pages: Copy 1 of 7  
OFFICE MEMORANDUM  
Copies:

DATE July 20, 1945 6/24/57

TO: Joe Hoffman  
John Blair  
FROM: Max Kupferberg } Section I-6 Searchlight Detachment  
Alex Nedzel  
SUBJECT: Cloud Observations and Radiation Measurements

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gfw 8/13/80  
EWS 8/24/80

The report includes data on the position of the cloud and on the radiation as measured by Searchlight Section I-6, situated 19.5 miles from position zero, 33° east of north. Azimuth and elevation angles are presented, as well as a description of the phenomena seen. The azimuth and elevation readings were combined with similar readings from Sl. Sec. I-7, I-2 and I-3 to determine the course of the cloud. The information was radioed to I-1, where the actual course was plotted by Capt. Allen. Measurements were taken on azimuth, elevation,  $\beta$  and  $\gamma$  radiation, starting at time,  $t = 0$ .

At time  $t = 0$ , all three observers were startled by the high intensity of the light from the explosion. They independently reported feeling the heat radiation on their faces. The last part of the ball of fire then rose above the hills between positions I-6 and Q. It was decided that it rose at least two diameters above the hills. It was at this point that the actual cloud became visible. It seemed to move directly along a vertical until the upper portion formed a dense white mushroom. The mushroom was trailed by a dusty red-brown streamer.

The radiation meters were closely watched from  $t = 0$  until the cloud was well into the sky. They indicated no increase in radiation. It might be noted that the part of the ball of fire seen from this position had very nicely formed billows in it. Once the cloud was sighted, readings on elevation, azimuth and radiation were recorded periodically (See Table I).

The radiation was measured both on the ground and approximately three feet above the ground. The major part of the radiation measurements were done within a fifty-yard square. Some measurements were taken at a mile east and a mile west of position I-6 and found to agree with the readings of position I-6. The meters used were a Landsverk and Wollan ( $\beta$  and  $\gamma$ ) quartz-fiber electrometer and a Victoreen  $\gamma$

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PER DOC REVIEW JAN. 1973



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INTER-OFFICE MEMORANDUM

To: Joe Hoffman

FROM: John Blair  
Max Kupferberg  
Alex Nedzel

SUBJECT: Cloud Observations and Radiation Measurements

DATE July 20, 1945 - Page 2

FINAL DETERMINATION  
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L. M. Redman

JUL 17 79

survey meter.

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The appearance of the cloud from the position L-8 is of interest. It was divided into three parts before the time  $t = 15$  minutes—a dense white mushroom cloud, a flat fairly long red dust cloud, and a reddish-brown column which seemed to come from position O. At the time  $t = 30$  minutes, the high mushroom cloud had moved directly towards position L-8, and had taken on the shape of the North American part of the western hemisphere. The lower red-brown cloud and column took on the shape of a question mark, while the brown dust seemed to be still emanating from position O. This was verified by the three observers. There was still no indication of  $\gamma$  or  $\beta$  radiation. At the time  $t = 55$  minutes, the mushroom part of the cloud was directly overhead and spreading out rather than moving to the east, as was the case between the time when the mushroom was formed and  $t = 55$  minutes. The radiation present at  $t = 55$  minutes was not enough to be recorded on the Landsverk and Wollan electrometer. From  $t = 55$  minutes until the cloud was obscured by a lower formation of clouds, it stayed at the zenith with respect to position L-8. Even when the cloud was obscured it was known that it did not move a great deal as a cloud, because the radioactive cloud was never seen to move from behind the lower formation of clouds. It seemed as though the cloud moved up overhead and was dispersed until its density was low enough to make it indistinguishable from other thin clouds. This doesn't mean that the material making up this cloud stayed over the region of position L-8. It spread over the whole area.

The radioactive cloud was hidden at  $t = 1$  hour and 10 minutes. Zenith and elevation readings could no longer be taken, but  $\gamma$  and  $\beta$  radiation readings were continued.

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INTER-OFFICE MEMORANDUM

To: Joe Hoffman  
FROM: John Blair  
Max Kupferberg  
Alex Nedzel  
SUBJECT: Cloud Observations and Radiation Measurements

DATE July 20, 1945 - Page 3

Radioactive material started to descend upon the position I-8 between the time  $t = 1$  hour, 30 minutes and 2 hours, 0 minutes, thirty-five minutes to an hour after it reached the zenith. At 2 hours, 0 minutes the radiation had increased to .10 R/hr. Before  $t = 1$  hour, 30 minutes the radiation was less than 1 m R/hr. The  $\gamma$  radiation measurement was made 1" above the ground level. The gamma radiation increased to 2.0 R/hr. at  $t = 2$  hours, 55 minutes. It then leveled off and continued at 2.0 R/hr. until time  $t = 3$  hours, 45 minutes. The curve of R/hr. vs. time then shows a decay.

Radiation readings were taken both on the ground and three feet above it on  $\gamma$ s and  $\beta$ s  $\neq \gamma$ s, respectively. Readings on  $\gamma$ s, taken three feet above the ground were 25% less than  $\gamma$  readings taken 1" above the ground (See Table I:  $t = 2$  hours, 55 minutes). When the  $\gamma$  radiation on the ground was 2.0 R/hr., the  $\beta$  activity on the ground was above 5.0 R/hr. The  $\gamma \neq \beta$  readings on the ground remained greater than 5 R/hr. for the duration of the readings. At the beginning of the descension, the  $\gamma \neq \beta$  activity was not appreciably larger than the  $\gamma$  activity alone. At the time 4 hours, 45 minutes, the Victoreen  $\gamma$  meter was loaned to the health group and all subsequent measurements were made with the L & W meter.

In addition to the data recorded at position I-8,  $\gamma$  radiation at Bingham, four miles west of Bingham, at White's store and at I-6 was recorded. The readings and the time at which they were taken are presented in Table I. John Magee reported 15.0 R/hr.  $\gamma$  radiation off the ground 3.5 miles east of I-8. This reading was checked and found to be correct. It was recorded at  $t = 3$  hours, 20 minutes.

As an interesting point it should be noted that at the time the average reading was .1 R/hr. there were small areas one foot square which had readings of .3 R/hr. and .5 R/hr. It is possible that fragments had fallen on these spots.

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INTER-OFFICE MEMORANDUM

To: Joe Hoffman

DATE July 20, 1945 - Page 4

~~xxx~~

FROM: John Blair  
Max Kupferberg  
Alex Nedzel

SUBJECT: Cloud Observations and Radiation Measurements

The readings taken with the radiation meters have an accuracy of  $\pm 10\%$ . The accuracy of the measurements are probably typical for the type of meters used. These meters were obtained from R. Watts, who is undoubtedly familiar with the accuracy of their calibrations.

Copies to: Bacher  
Hershfelder  
Hoffman  
Kupferberg  
Nedzel  
Oppenheimer  
Warren

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